

What is an Earth-like planet?

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A terrestrial planet is a planet, mainly made of rock that orbits a star in the region where the black-sphere temperature is less than 400K and more than 200K. This would include the Moon, Earth, Mars and Venus in the Solar System. However, the Moon, Mars and Venus show us facets of being very unlike Earth in their spectra. Does the difference include two steps, being habitable and being inhabited, or does the persistence of habitability depend on being inhabited? Two very different answers may be suggested. The first, the Gaia hypothesis, is that there is an intricate interaction between biological, geological and meteorological processes on earth that have produced a relatively stable environment that has allowed living organisms to persist. In the absence of life-caused stabilization, oceans would not persist and climate would be less stable. The alternative hypothesis is that there is an inorganic suite of processes that have produced a modest level of climate stability on earth, and preservation of oceans, and that coupled with a vertical thermal gradient through the rock and atmosphere, life has always been able to find a niche. In this alternative hypothesis, biological processes have, for most of the time, exerted relatively minor effects on persistence of oceans and stabilization of temperature. In this model, life rides on the inorganic processes. We begin this comparison of the hypotheses by using Earthshine observations to help ask whether there are, or are likely to have been significant biological modifications to the Earth albedo.